SECTION 7.5

AGRICULTURAL HARVEST OPERATIONS

(Revised January 2003)

EMISSION INVENTORY SOURCE CATEGORY
  Miscellaneous Processes / Farming Operations

EMISSION INVENTORY CODES (CES CODES) AND DESCRIPTION
  620-615-5400-0000 (83980) Agricultural Harvest Operations

METHODS AND SOURCES

The activities used to harvest agricultural commodities entrain soil and plant material into the air. These emissions may simply be due to the vehicles traveling over the soil, or via the mechanical processing of the plant material and underlying soil, or, as in the case of almonds, via the actual blowing or sweeping of the crop to remove waste materials and position it for pickup. Although at the time of this update, harvest particulate matter emission factors measured in California are only available for cotton, almonds, and wheat, all other crops are assigned emission factor by scaling from these measured emission factors. The attached Table 1 shows the total particulate matter and PM_{10} fraction of the harvest emissions estimates for these crops. As additional measured harvest emission factors for more crops are available, they will be incorporated into this methodology.

Particulate emissions from harvest operations are computed by multiplying an emission factor by an activity factor. Agricultural harvest particulate dust emissions are estimated for all crops in each county in California using the following equation:

$$Emissions_{crop} = Emission\ Factor_{crop} \times Acres\ Harvested_{crop}$$

The individual crop emissions for each county are summed to produce the county and statewide total particulate matter and PM_{10} fraction of the harvest emission estimates. For harvesting, the emission factors are based on measurements performed by UC Davis [1], and harvested acreage is based on 2000 summary data from the California Department of Food and Agriculture (CDFA) [2]. The remainder of this section discusses the emission factors and acreage in more detail.

Emission Factor. The emission factors used to estimate the PM_{10} dust emissions from agricultural harvesting are from a study performed by UC Davis [1] under contract to the USDA and their subsequent supplementary data analysis [3]. PM_{10} emissions were measured during 1994 to 1998 harvest operations. The emission factors are shown below in Table A.   Using the available emission factors as a baseline, harvest emission

factors were approximated for other California crops in consultation with agricultural experts.

Table A. California Harvest Emission Factors

Agricultural Harvest Operation	Emission Factor (lbs PM_{10}/acre)
Cotton	
Cotton Picking	1.7
Cotton Stalk Cutting	1.7
Cotton Total	**3.4**
Almond	
Almond Shaking	0.37
Almond Sweeping	3.7
1stAlmond Pickup	36.7
2nd Almond Pickup	
Almond Total	**40.8**
Wheat	
Combining	5.8

The emission rate assumptions were assigned to reflect the relative geologic PM_{10} generation potential of various harvest practices. Table B below provides examples of some of the emission factor assignments. Assumptions for all crops are provided in the attached Table 2.

Table B. Example Harvest Emission Factor Assumptions

Crop	Assumption	Harvest Emission Factor (lbs PM_{10}/acre)
Cotton	Cotton	3.4
Vine	Cotton/20	0.17
Tomato	Cotton/20	0.17
Fruit Trees	Cotton/40	0.085
Corn	Wheat/2	2.8
Alfalfa	Zero	0.0
Walnuts	Almonds	40.8
Sugar beets, onions, potatoes	Cotton/2	2.7

Unlike the soil preparations activities (e.g., discing, tilling, etc.) harvest operations tend to be fairly unique for each crop. Because of this, harvest emission factors generally combine all of the operations that go into harvesting a commodity into a single factor that includes emissions from all of the relevant operations. Because of this, acre-passes, which are used in estimating emissions from soil preparation operations, are not needed for harvesting.

Although the UCD study shows trends in PM_{10} emission factors with environmental conditions such as relative humidity and soil moisture, the incorporation of environmental factors are still under exploration. If it is needed and there is an appropriate way to incorporate the environmental factor effects in the future, this methodology will be updated.

The UC Davis researchers directly measured PM_{10} emissions. Because the ARB's databases store TSP (total suspended particulate) emissions, in order to get TSP, the PM_{10} emissions are multiplied by 2.2, which is the ARB's soil size speciation value for agricultural tilling dust.

Acres. The acreage data used for estimating harvest emissions are from the California Department of Food and Agriculture's (CDFA) summary of crop acreage harvested in 2000. The acreage data, compiled from individual county agricultural commissioner reports, were subdivided by county and crop type for the entire state. Complete listings of individual county crop acreage are provided in the land preparation background document.

Crop Calendar. Harvesting is performed at very specific times each year, so crop calendar data, which tells when harvest activities occur, is important. To get the best estimates possible, staff of the ARB met with producers of the various commodities to gather the most realistic and current information available on when harvesting occurs. Focusing on the largest acreage crops, we were able to gather updated information for about 90% of California's crop acreage. For the crops that were not explicitly updated, we either applied an updated crop profile from a similar crop, or used one of the existing ARB profiles. Using these data, we created detailed temporal profiles that help to indicate when PM emissions from harvesting may be highest. The background document for soil preparation operations includes detailed calendars for each crop.

ASSUMPTIONS

1. The current harvest emission factors assume that for each crop, harvesting produces the same level emissions under all conditions for all equipment.
2. The emission factors for crops other than almonds, cotton, and wheat were assigned to reflect the relative geologic PM_{10} generation potential of various harvest practices.
3. Crop calendar data collected for San Joaquin Valley crops and practices were extrapolated to the same crops in the remainder of the state.

TEMPORAL ACTIVITY

Temporal activity for harvesting is derived by summing, for each county, the monthly emissions from all crops. For each crop, the monthly emissions were calculated based on its monthly profile, which reflects the percentage of harvesting activities occurs in that month. Below is an example of the monthly profile for almonds, cotton, and wheat. Because the crop composite differs by county, the monthly profiles for each county are different from each other. An example of some composite county monthly profiles is shown below in Tables C-1 through C-3. Table 3 lists the composite temporal data for each county. The background document provides details on how the monthly temporal profiles were developed.

Table C-1. Temporal profile

CES	Hours	Days	Weeks
47332	24	7	52

Table C-2. Monthly Profile of Crops

Crops	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Almonds	0	0	0	0	0	0	0	0	50	50	0	0
Cotton	0	0	0	0	0	0	0	0	0	50	50	0
Wheat	0	0	0	0	0	50	50	0	0	0	0	0

Table C-3. County Harvest Profile Composite

County	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Fresno	0.1	0.1	0.2	0.2	0.1	5.6	5.9	0.8	30.7	42.8	13.6	0.1

COMMENTS AND RECOMMENDATIONS

The scaling approach used to assign the three available PM emission factors to the dozens of California crops is highly subjective. Initial scaling assignments were made by ARB staff, then they were refined by members of the agricultural community. Members of the SJV Agricultural Technical Advisory Group concluded that it was more realistic at this time to include rough approximations of PM harvest emissions than to set the values to zero, as has been done historically.

As additional harvest emissions data are collected, they will be incorporated into the methodology and the emissions estimates will be recalculated.

CHANGES IN METHOD AND EMISSION ESTIMATES

There were significant improvements to the harvesting emissions estimates for this update. These include:

- Incorporation of new crop specific emission factors;
- Approximating emission factors for all crops by scaling measured emission factors.
- Use of updated 2000 crop acreage data from the California Department of Food and Agriculture.

These changes produced an estimated emissions increase of about 80% from the previous 1993 emission inventory estimates for agricultural harvest operations. The change was predominately due to increases in the base emission factors, and the inclusion of all harvested crops, many of which were previously set to zero emissions.

GROWTH PARAMETERS

Growth in this category is based on the crop acreage projection estimated by the Department of Water Resources. The growth varies by regions.

SAMPLE CALCULATIONS

To estimate PM10 emissions from agricultural harvest operations, the following method is used:

Step 1: Acreage. The acres harvested for a few of the crops in Fresno county are shown in the 'Acres' column of the table. These data are available from the county agricultural commissioner annual reports or the CDFA. The 2000 acreage data are summarized in the agricultural land preparation background document.

Step 2: Crop specified Emission Factor. Using the data in Table 2, assign the appropriate emission factor for each crop.

Step 3: Calculate Crop PM_{10} emissions. Multiply the acres for each crop by the appropriate emission factor, then divide by 2000 lbs/ton to compute annual tons of PM_{10} emissions.
Emissions = (Acres x Emission Factor) / 2000

Step 4: County total emissions. Sum the emissions for each crop to compute the total available PM_{10} emissions from harvest operations.

Table D. Estimating Harvest Operation Emissions in Fresno County

Crop	Acres	Emission Factor (lbs PM10/acre)	PM_{10} Emissions (tons PM10/yr)
Almonds All	57350	40.77	1169.1
Barley Feed	4100	5.8	11.9
…	…	…	…
Total	1189319		2088.7

REFERENCES

1.   Flocchini, R.G., James, T.A., et al. Sources and Sinks of PM10 in the San Joaquin Valley (Interim Report), a study for United States Department of Agriculture Special Research Grants Program. Contract Nos. 94-33825-0383 and 98-38825-6063. August 10, 2001.

2.   California Agricultural Statistics Service. 2000 acreage extracted from agricultural commissioner's reports. Sacramento, CA.

3.   Terry Cassel. Informal write-up for SJV Ag Tech Committee, Evaluation of ARB application of UCD emission factors, July 12, 2002.

4.   Gaffney, P.H. Methodology for Assigning PM_{10} Emission Factors for California Agriculture Harvest Activities, Memorandum to SJV PM_{10} SIP Emission Inventory Group. December 2002.

5.   Yu, Hong. Agricultural Harvest: Geologic Particulate Matter Emission Estimates, Background Document. California Air Resources Board. December 2002.

UPDATED BY

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TABLE 1
2000 Agricultural harvest PM$_{10}$ and TSP emissions
EIC: 620-615-5400-0000; CES: 85980; Activity: Acres

Air Basin	County ID #	County	Acres	PM$_{10}$ Emissions (tpy)	TSP Emissions (tpy)
GBV	2	ALPINE	0	0	0
	14	INYO	4,660	0.9	2.0
	26	MONO	10,935	1.6	3.5
LC	17	LAKE	18,457	103.9	228.7
LT	9	EL DORADO	396	0.6	1.3
	31	PLACER	2,233	4.0	8.7
MC	3	AMADOR	6,196	11.1	24.5
	5	CALAVERAS	1,880	14.6	32.0
	9	EL DORADO	2,908	4.3	9.4
	22	MARIPOSA	1,239	0.1	0.2
	29	NEVADA	303	0.0	0.1
	31	PLACER	13,624	24.1	53.1
	32	PLUMAS	12,950	6.5	14.4
	46	SIERRA	4,500	2.5	5.6
	55	TUOLUMNE	770	0.6	1.4
MD	15	KERN	280,668	792.0	1,743.3
	19	LOS ANGELES	13,790	2.7	5.9
	33	RIVERSIDE	68,678	28.3	62.3
	36	SAN	11,171	1.0	2.3
NC	8	DEL NORTE	2,440	2.1	4.5
	12	HUMBOLDT	1,600	0.9	2.0
	23	MENDOCINO	16,301	1.2	2.7
	49	SONOMA	36,726	10.4	22.9
	53	TRINITY	175	0.1	0.3
NCC	27	MONTEREY	319,356	52.5	115.5
	35	SAN BENITO	56,726	81.1	178.5
	44	SANTA CRUZ	19,652	1.4	3.1
NEP	18	LASSEN	76,895	43.1	95.0
	25	MODOC	363,716	72.8	160.3
	47	SISKIYOU	103,879	108.8	239.5
SC	19	LOS ANGELES	9,194	1.8	4.0
	30	ORANGE	11,328	1.4	3.2
	33	RIVERSIDE	84,186	34.7	76.4
	36	SAN	27,349	2.5	5.6
SCC	40	SAN LUIS OBISPO	109,106	129.9	285.9
	42	SANTA BARBARA	115,638	16.7	36.8
	56	VENTURA	99,157	7.7	16.9
SD	37	SAN DIEGO	58,006	8.8	19.4
SF	1	ALAMEDA	8,789	3.2	7.0
	7	CONTRA COSTA	31,480	41.2	90.8
	21	MARIN	6,336	3.2	7.0
	28	NAPA	33,436	7.0	15.3
	38	SAN FRANCISCO			0.0
	41	SAN MATEO	3,897	1.9	4.1
	43	SANTA CLARA	21,268	13.5	29.6
	48	SOLANO	32,379	66.7	146.9
	49	SONOMA	23,481	6.6	14.6
SJV	10	FRESNO	1,189,319	2,088.7	4,597.7
	15	KERN	596,420	1,682.9	3,704.5
	16	KINGS	573,639	889.8	1,958.6
	20	MADERA	302,610	1,146.7	2,524.1
	24	MERCED	503,793	1,920.6	4,227.7
	39	SAN JOAQUIN	548,940	1,927.4	4,242.6
	50	STANISLAUS	386,435	2,376.8	5,231.8
	54	TULARE	761,224	1,288.1	2,835.3
SS	13	IMPERIAL	589,996	279.1	614.3
	33	RIVERSIDE	68,678	28.3	62.3
SV	4	BUTTE	198,477	1,212.1	2,668.1
	6	COLUSA	292,410	792.6	1,744.6
	11	GLENN	224,816	861.2	1,895.7
	31	PLACER	6,477	11.5	25.2
	34	SACRAMENTO	132,613	117.4	258.4
	45	SHASTA	26,401	30.7	67.5
	48	SOLANO	129,514	266.9	587.6
	51	SUTTER	262,736	643.4	1,416.3
	52	TEHAMA	52,769	391.7	862.1
	57	YOLO	325,147	573.3	1,261.9
	58	YUBA	74,329	249.0	548.2
		State Totals	**9,374,598**	**20,498.3**	**45,120.7**

PM Fraction: PM$_{10}$ = TSP X 0.4543 (TSP Emissions = PM$_{10}$ / 0.4543)

TABLE 2
Summary of Crop Emission Factor Assumption

CDFA Crop Code	CDFA Crop Description	Crop Profile	Assumption	Emission Factor (lbs PM$_{10}$/acre)
101999	WHEAT ALL	Wheat	Wheat/1	5.8
104999	RYE FOR GRAIN	Wheat	Wheat/1	5.8
106199	RICE, FOR MILLING	Rice	Cotton/2	1.68
106269	FIELD CROP BY PRODUCTS	Cotton	Cotton/20	0.17
108999	FOOD GRAINS, MISC	Corn	Cotton/2	1.68
111559	CORN, WHITE	Corn	Cotton/40	0.08
111991	CORN FOR GRAIN	Corn	Cotton/2	1.68
111992	CORN FOR SILAGE	Corn	Cotton/20	0.17
112999	OATS FOR GRAIN	Wheat	Wheat/1	5.8
113994	BARLEY, MALTING	Wheat	Wheat/1	5.8
113995	BARLEY, FEED	Wheat	Wheat/1	5.8
113999	BARLEY, UNSPECIFIED	Wheat	Wheat/1	5.8
114991	SORGHUM, GRAIN	Wheat	Wheat/1	5.8
121219	COTTON LINT, UPLAND	Cotton	Cotton/1	3.37
121229	COTTON LINT, PIMA	Cotton	Cotton/1	3.37
121299	COTTON LINT, UNSPEC	Cotton	Cotton/1	3.37
132999	SUGAR BEETS	Sugar Beets	Cotton/2	1.68
151999	COTTONSEED	Cotton	Cotton/1	3.37
153999	PEANUTS, ALL	Safflower	Cotton/2	1.68
158269	SAFFLOWER	Safflower	Wheat/1	5.8
158316	SUNFLOWER SEED, PLANTING	Corn	Wheat/1	5.8
158319	SUNFLOWER SEED	Corn	Wheat/1	5.8
158499	JOJOBA	Melon	Cotton/40	0.08
161131	BEANS, LIMAS, LG. DRY	DryBeans	Cotton/2	1.68
161132	BEANS, LIMAS, BABY DRY	DryBeans	Cotton/2	1.68
161199	LIMA BEANS, UNSPECIFIED	DryBeans	Cotton/2	1.68
161717	BEANS, RED KIDNEY	DryBeans	Cotton/2	1.68
161721	BEANS, PINK	DryBeans	Cotton/2	1.68
161741	BEANS, BLACKEYE (PEAS)	DryBeans	Cotton/2	1.68
161742	BEANS, GARBANZO	Garbanzo	Cotton/2	1.68
162399	BEANS, FAVA	DryBeans	Cotton/2	1.68
163999	PEAS, DRY EDIBLE	DryBeans	Cotton/20	0.17
169999	BEANS,UNSPEC. DRY EDIBLE	DryBeans	Cotton/2	1.68
171019	SEED WHEAT	Wheat	Wheat/1	5.8
171049	SEED RYE	Wheat	Wheat/1	5.8
171069	SEED RICE	Rice	Cotton/2	1.68
171129	SEED OATS	Wheat	Wheat/1	5.8
171139	SEED BARLEY	Wheat	Wheat/1	5.8
171519	SEED, COTTON FOR PLANTING	Cotton	Cotton/1	3.37
171582	SEED, SAFFLOWER, PLANTING	Safflower	Wheat/1	5.8
171619	SEED BEANS	DryBeans	Cotton/2	1.68
171639	SEED PEAS	DryBeans	Cotton/20	0.17
171949	SEED, MISC FIELD CROP	Corn	Cotton/20	0.17
171959	SEED, VEG & VINECROP	Vegetables	Cotton/20	0.17
172119	SEED, ALFALFA	Alfalfa	Zero/1	0
172289	CLOVER, UNSPECIFIED SEED	Alfalfa	Zero/1	0
173079	SEED, BERMUDA GRASS	Alfalfa	Zero/1	0
173669	SEED, SUDAN GRASS	Alfalfa	Zero/1	0
173999	SEED, GRASS, UNSPECIFIED	Alfalfa	Zero/1	0
178999	SEED, OTHER (NO FLOWERS)	Alfalfa	Cotton/20	0.17
181999	HAY, ALFALFA	Alfalfa	Zero/1	0
188499	HAY, GRAIN	Alfalfa	Cotton/2	1.68
188799	HAY, WILD	Alfalfa	Cotton/2	1.68
188899	HAY, SUDAN	Alfalfa	Zero/1	0
188999	HAY, OTHER UNSPECIFIED	Alfalfa	Cotton/2	1.68
194599	PASTURE, IRRIGATED	No Land	Zero/1	0
194699	PASTURE, RANGE	No Land	Zero/1	0
194799	PASTURE, MISC. FORAGE	No Land	Zero/1	0
195199	SILAGE	Wheat	Cotton/20	0.17
195299	HAY, GREEN CHOP	Alfalfa	Zero/1	0
195399	STRAW	Alfalfa	Wheat/1	5.8
198199	RICE, WILD	Rice	Cotton/2	1.68
198999	FIELD CROPS, UNSPEC.	Corn	Cotton/20	0.17
201119	ORANGES, NAVEL	Citrus	Cotton/40	0.08
201519	ORANGES, VALENCIAS	Citrus	Cotton/40	0.08
201999	ORANGES, UNSPECIFIED	Citrus	Cotton/40	0.08
202999	GRAPEFRUIT, ALL	Citrus	Cotton/40	0.08
203999	TANGERINES & MANDARINS	Citrus	Cotton/40	0.08
204999	LEMONS, ALL	Citrus	Cotton/40	0.08
205999	LIMES, ALL	Citrus	Cotton/40	0.08
206999	TANGELOS	Citrus	Cotton/40	0.08
207999	KUMQUATS	Citrus	Cotton/40	0.08

TABLE 2 (continued)
Summary of Crop Emission Factor Assumption

CDFA Crop Code	CDFA Crop Description	Crop Profile	Assumption	Emission Factor (lbs PM10/acre)
208059	CITRUS, MISC BY-PROD	Citrus	Cotton/40	0.08
209999	CITRUS, UNSPECIFIED	Citrus	Cotton/40	0.08
211999	APPLES, ALL	Citrus	Cotton/40	0.08
212199	PEACHES, FREESTONE	Citrus	Cotton/40	0.08
212399	PEACHES, CLINGSTONE	Citrus	Cotton/40	0.08
212999	PEACHES, UNSPECIFIED	Citrus	Cotton/40	0.08
213199	CHERRIES, SWEET	Citrus	Cotton/40	0.08
214199	PEARS, BARLETT	Citrus	Cotton/40	0.08
214899	PEARS, ASIAN	Citrus	Cotton/40	0.08
214999	PEARS, UNSPECIFIED	Citrus	Cotton/40	0.08
215199	PLUMS	Citrus	Cotton/40	0.08
215399	PLUMCOTS	Citrus	Cotton/40	0.08
215999	PRUNES, DRIED	Citrus	Cotton/40	0.08
216199	GRAPES, TABLE	Grapes-Table	Cotton/20	0.17
216299	GRAPES, WINE	Grapes-Wine	Cotton/20	0.17
216399	GRAPES, RAISIN	Grapes-Raisin	Cotton/20	0.17
216999	GRAPES, UNSPECIFIED	Grapes-Wine	Cotton/20	0.17
217999	APRICOTS, ALL	Citrus	Cotton/40	0.08
218199	NECTARINES	Citrus	Cotton/40	0.08
218299	PERSIMMONS	Citrus	Cotton/40	0.08
218399	POMEGRANATES	Citrus	Cotton/40	0.08
218499	QUINCE	Citrus	Cotton/40	0.08
218839	CHERIMOYAS	Citrus	Cotton/40	0.08
218889	ORCHARD BIOMASS	Almonds	Cotton/40	0.08
218899	FRUITS & NUTS, UNSPEC.	Citrus	Cotton/40	0.08
221999	AVOCADOS, ALL	Citrus	Cotton/40	0.08
224999	DATES	Citrus	Almonds/20	2.04
225999	FIGS, DRIED	Citrus	Almonds/20	2.04
226999	OLIVES	Citrus	Cotton/40	0.08
228019	GUAVAS	Citrus	Cotton/40	0.08
229999	KIWIFRUIT	Citrus	Cotton/40	0.08
230639	BERRIES, BLACKBERRIES	Grapes-Table	Cotton/40	0.08
230869	BERRIES, BOYSENBERRIES	Grapes-Table	Cotton/40	0.08
234799	BERRIES, LOGANBERRIES	Grapes-Table	Cotton/40	0.08
236199	BERRIES, RASPBERRIES	Grapes-Table	Cotton/40	0.08
237199	STRAWBERRIES, FRESH MKT	Melon	Cotton/40	0.08
237299	STRAWBERRIES, PROC	Melon	Cotton/40	0.08
237999	STRAWBERRIES, UNSPECIFIED	Melon	Cotton/40	0.08
239999	BERRIES, BUSH, UNSPECIFIED	Grapes-Table	Cotton/40	0.08
261999	ALMONDS, ALL	Almonds	Almonds/1	40.77
263999	WALNUTS, ENGLISH	Almonds	Almonds/1	40.77
264999	PECANS	Almonds	Almonds/10	4.08
265999	WALNUTS, BLACK	Almonds	Almonds/1	40.77
266999	CHESTNUTS	Almonds	Almonds/10	4.08
267999	MACADAMIA NUT	Almonds	Almonds/10	4.08
268079	PISTACHIOS	Almonds	Almonds/10	4.08
268099	ALMOND HULLS	Almonds	Almonds/1	40.77
301999	ARTICHOKES	Melon	Cotton/40	0.08
302199	ASPARAGUS, FRESH MKT	Melon	Cotton/2	1.68
302299	ASPARAGUS, PROC	Melon	Cotton/2	1.68
302999	ASPARAGUS, UNSPECIFIED	Melon	Cotton/2	1.68
303999	BEANS, GREEN LIMAS	DryBeans	Cotton/2	1.68
304199	BEANS, SNAP FR MKT	DryBeans	Cotton/20	0.17
304299	BEANS, SNAP PROC	DryBeans	Cotton/20	0.17
304399	BEANS FRESH UNSPECIFIED	DryBeans	Cotton/20	0.17
304999	BEANS, UNSPECIFIED SNAP	DryBeans	Cotton/20	0.17
305999	BEETS, GARDEN	Sugar Beets	Cotton/2	1.68
306999	RAPINI	Sugar Beets	Cotton/40	0.08
307189	BROCCOLI,FOOD SERV	Vegetables	Cotton/40	0.08
307199	BROCCOLI, FR MKT	Vegetables	Cotton/40	0.08
307299	BROCCOLI, PROC	Vegetables	Cotton/40	0.08
307919	BROCCOLI, UNSPECIFIED	Vegetables	Cotton/40	0.08
308999	BRUSSELS SPROUTS	Melon	Cotton/40	0.08
309999	CABBAGE, CH. & SPECIALTY	Lettuce	Cotton/40	0.08
310999	CABBAGE, HEAD	Lettuce	Cotton/40	0.08
313189	CARROTS, FOOD SERV	Sugar Beets	Cotton/20	0.17
313199	CARROTS, FR MKT	Sugar Beets	Cotton/20	0.17
313299	CARROTS, PROC	Sugar Beets	Cotton/20	0.17
313999	CARROTS, UNSPECIFIED	Sugar Beets	Cotton/20	0.17
314189	CAULIFLOWER, FOOD SERV	Vegetables	Cotton/40	0.08
314199	CAULIFLOWER, FR MKT	Vegetables	Cotton/40	0.08
314299	CAULIFLOWER, PROC	Vegetables	Cotton/40	0.08

TABLE 2 (continued)
Summary of Crop Emission Factor Assumption

CDFA Crop Code	CDFA Crop Description	Crop Profile	Assumption	Emission Factor (lbs PM10/acre)
314999	CAULIFLOWER, UNSPECIFIED	Vegetables	Cotton/40	0.08
316189	CELERY, FOOD SERV	Lettuce	Cotton/40	0.08
316199	CELERY, FR MKT	Lettuce	Cotton/40	0.08
316299	CELERY, PROC	Lettuce	Cotton/40	0.08
316999	CELERY, UNSPECIFIED	Lettuce	Cotton/40	0.08
318999	RADICCHIO	Lettuce	Cotton/40	0.08
320999	CHIVES	Lettuce	Cotton/40	0.08
322999	COLLARD GREENS	Lettuce	Cotton/40	0.08
323999	CORN, SWEET ALL	Corn	Cotton/40	0.08
325999	CUCUMBERS	Vegetables	Cotton/40	0.08
330999	EGGPLANT, ALL	Vegetables	Cotton/40	0.08
331999	ENDIVE, ALL	Lettuce	Cotton/40	0.08
332999	ESCAROLE, ALL	Lettuce	Cotton/40	0.08
333999	ANISE (FENNEL)	Lettuce	Cotton/2	1.68
335999	GARLIC, ALL	Garlic	Cotton/2	1.68
337999	KALE	Lettuce	Cotton/40	0.08
338999	KOHLRABI	Lettuce	Cotton/40	0.08
339196	LETTUCE, BULK SALAD PRODS.	Lettuce	Cotton/40	0.08
339999	LETTUCE, UNSPECIFIED	Lettuce	Cotton/40	0.08
340999	LETTUCE, HEAD	Lettuce	Cotton/40	0.08
341999	LETTUCE, ROMAINE	Lettuce	Cotton/40	0.08
342999	LETTUCE, LEAF	Lettuce	Cotton/40	0.08
343999	MELON, CANTALOUPE	Melon	Cotton/40	0.08
348999	MELON, HONEYDEW	Melon	Cotton/40	0.08
354299	MELON, UNSPECIFIED	Melon	Cotton/40	0.08
354999	MELON, WATER MELONS	Melon	Cotton/40	0.08
355999	MUSHROOMS	No Land Prep.	Zero/1	0
356999	MUSTARD	Lettuce	Cotton/40	0.08
357999	OKRA	Lettuce	Cotton/40	0.08
358999	ONIONS	Onions	Cotton/2	1.68
359999	PARSLEY	Lettuce	Cotton/40	0.08
361299	PEAS, GREEN, PROCESSING	DryBeans	Cotton/20	0.17
361999	PEAS, GREEN, UNSPECIFIED	DryBeans	Cotton/20	0.17
363999	PEPPERS, BELL	Tomatoes	Cotton/40	0.08
364999	PEPPERS, CHILI, HOT	Tomatoes	Cotton/40	0.08
366999	PUMPKINS	Melon	Cotton/20	0.17
367999	RADISHES	Sugar Beets	Cotton/40	0.08
368999	RHUBARB	Lettuce	Cotton/40	0.08
370999	RUTABAGAS	Sugar Beets	Cotton/2	1.68
372999	ONIONS, GREEN & SHALLOTS	Onions	Cotton/40	0.08
374189	SPINACH, FOOD SERV	Lettuce	Cotton/40	0.08
374199	SPINACH, FR MKT	Lettuce	Cotton/40	0.08
374299	SPINACH, PROC	Lettuce	Cotton/40	0.08
374999	SPINACH UNSPECIFIED	Lettuce	Cotton/40	0.08
375999	SQUASH	Melon	Cotton/20	0.17
376999	SWISSCHARD	Lettuce	Cotton/40	0.08
378199	TOMATOES, FRESH MARKET	Tomatoes	Cotton/40	0.08
378299	TOMATOES, PROCESSING	Tomatoes	Cotton/20	0.17
378999	TOMATOES, UNSPECIFIED	Tomatoes	Cotton/20	0.17
380999	TURNIPS, ALL	Sugar Beets	Cotton/2	1.68
381999	GREENS, TURNIP & MUSTARD	Lettuce	Cotton/40	0.08
387999	LEEKS	Onions	Cotton/40	0.08
391999	POTATOES, IRISH ALL	Sugar Beets	Cotton/2	1.68
392999	SWEET POTATOES	Sugar Beets	Cotton/2	1.68
393999	HORSERADISH	Onions	Cotton/40	0.08
394199	SALAD GREENS NEC	Lettuce	Cotton/40	0.08
394999	PEAS, EDIBLE POD (SNOW)	DryBeans	Cotton/20	0.17
395999	VEGETABLES, ORIENTAL, ALL	Vegetables	Cotton/40	0.08
396999	SPROUTS, ALFALFA & BEAN	Lettuce	Cotton/40	0.08
398199	CUCUMBERS, GREENHOUSE	No Land Prep.	Zero/1	0
398299	TOMATOES, GREENHOUSE	No Land Prep.	Zero/1	0
398399	TOMATOES, CHERRY	Tomatoes	Cotton/40	0.08
398499	TOMATILLO	Tomatoes	Cotton/40	0.08
398559	CILANTRO	Lettuce	Cotton/40	0.08
398599	SPICES AND HERBS	Lettuce	Cotton/40	0.08
398899	VEGETABLES, BABY	Vegetables	Cotton/40	0.08
398999	VEGETABLES, UNSPECIFIED	Vegetables	Cotton/20	0.17
832919	POTATOES SEED	Sugar Beets	Cotton/2	1.68
892999	NURSERY TURF	No Land Prep.	Zero/1	0

TABLE 3
Seasonal Profile for Agricultural Harvest Emissions

Air	ID #	County	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
GBV	2	ALPINE												
	14	INYO	0.001	0.001	0.136	0.136	0.136	0.145	0.145	0.145	0.145	0.010	0.001	0.001
	26	MONO	0.005	0.005	0.119	0.119	0.119	0.147	0.147	0.147	0.147	0.033	0.005	0.005
LC	17	LAKE	0.000	0.000	0.006	0.006	0.006	0.006	0.006	0.006	0.482	0.476	0.003	0.000
LT	9	EL DORADO	0.001	0.001	0.010	0.010	0.010	0.010	0.010	0.010	0.463	0.454	0.021	0.001
	31	PLACER	0.000	0.000	0.014	0.014	0.014	0.014	0.014	0.014	0.409	0.395	0.112	0.000
MC	3	AMADOR	0.000	0.000	0.013	0.013	0.013	0.013	0.013	0.013	0.454	0.441	0.026	0.000
	5	CALAVERAS	0.000	0.000	0.002	0.002	0.002	0.002	0.002	0.002	0.493	0.490	0.003	0.000
	9	EL DORADO	0.001	0.001	0.010	0.010	0.010	0.010	0.010	0.010	0.463	0.454	0.021	0.001
	22	MARIPOSA	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.413	0.413	0.076	0.011
	29	NEVADA	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000
	31	PLACER	0.000	0.000	0.014	0.014	0.014	0.014	0.014	0.014	0.409	0.395	0.112	0.000
	32	PLUMAS	0.000	0.000	0.143	0.143	0.143	0.143	0.143	0.143	0.143	0.000	0.000	0.000
	46	SIERRA	0.000	0.000	0.143	0.143	0.143	0.143	0.143	0.143	0.143	0.000	0.000	0.000
	55	TUOLUMNE	0.000	0.000	0.143	0.143	0.143	0.143	0.143	0.143	0.143	0.000	0.000	0.000
MD	15	KERN	0.001	0.001	0.002	0.002	0.002	0.054	0.056	0.005	0.363	0.434	0.078	0.001
	19	LOS ANGELES	0.015	0.015	0.068	0.068	0.066	0.153	0.153	0.153	0.162	0.112	0.019	0.015
	33	RIVERSIDE	0.012	0.012	0.023	0.023	0.022	0.135	0.135	0.025	0.031	0.282	0.288	0.012
	36	SAN	0.011	0.011	0.100	0.100	0.099	0.100	0.101	0.101	0.207	0.119	0.040	0.011
NC	8	DEL NORTE	0.000	0.000	0.143	0.143	0.143	0.143	0.143	0.143	0.143	0.000	0.000	0.000
	12	HUMBOLDT	0.000	0.000	0.135	0.135	0.135	0.163	0.163	0.135	0.135	0.000	0.000	0.000
	23	MENDOCINO	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.881	0.011
	49	SONOMA	0.001	0.001	0.051	0.051	0.051	0.139	0.139	0.051	0.178	0.128	0.210	0.001
	53	TRINITY	0.000	0.000	0.143	0.143	0.143	0.143	0.143	0.143	0.143	0.000	0.000	0.000
NCC	27	MONTEREY	0.008	0.008	0.044	0.044	0.013	0.200	0.206	0.046	0.135	0.163	0.126	0.008
	35	SAN BENITO	0.000	0.000	0.029	0.029	0.027	0.099	0.100	0.031	0.352	0.327	0.005	0.000
	44	SANTA CRUZ	0.022	0.022	0.077	0.077	0.039	0.185	0.185	0.081	0.081	0.059	0.150	0.022
NEP	18	LASSEN	0.000	0.000	0.109	0.109	0.109	0.211	0.211	0.109	0.119	0.011	0.011	0.000
	25	MODOC	0.005	0.005	0.048	0.048	0.048	0.361	0.361	0.051	0.051	0.009	0.006	0.005
	47	SISKIYOU	0.004	0.004	0.023	0.023	0.023	0.430	0.430	0.025	0.025	0.006	0.004	0.004
SC	19	LOS ANGELES	0.015	0.015	0.068	0.068	0.066	0.153	0.153	0.153	0.162	0.112	0.019	0.015
	30	ORANGE	0.009	0.009	0.015	0.015	0.009	0.027	0.048	0.048	0.071	0.381	0.358	0.009
	33	RIVERSIDE	0.012	0.012	0.023	0.023	0.022	0.135	0.135	0.025	0.031	0.282	0.288	0.012
	36	SAN	0.011	0.011	0.100	0.100	0.099	0.100	0.101	0.101	0.207	0.119	0.040	0.011
SCC	40	SAN LUIS	0.001	0.001	0.017	0.017	0.016	0.252	0.261	0.025	0.209	0.187	0.015	0.001
	42	SANTA	0.014	0.014	0.054	0.054	0.041	0.058	0.058	0.056	0.139	0.254	0.241	0.014
	56	VENTURA	0.029	0.029	0.058	0.058	0.029	0.055	0.061	0.061	0.070	0.273	0.248	0.029
SD	37	SAN DIEGO	0.027	0.027	0.072	0.072	0.071	0.218	0.224	0.079	0.101	0.051	0.031	0.027
SF	1	ALAMEDA	0.000	0.000	0.124	0.124	0.124	0.124	0.124	0.124	0.155	0.031	0.069	0.000
	7	CONTRA COSTA	0.000	0.000	0.005	0.005	0.005	0.081	0.119	0.044	0.386	0.346	0.007	0.000
	21	MARIN	0.000	0.000	0.132	0.132	0.132	0.167	0.167	0.132	0.132	0.000	0.003	0.000
	28	NAPA	0.000	0.000	0.016	0.016	0.016	0.016	0.016	0.016	0.266	0.250	0.391	0.000
	38	SAN FRANCISCO												
	41	SAN MATEO	0.002	0.002	0.054	0.054	0.054	0.294	0.294	0.062	0.062	0.059	0.061	0.002
	43	SANTA CLARA	0.001	0.001	0.046	0.046	0.044	0.054	0.059	0.059	0.358	0.313	0.015	0.001
	48	SOLANO	0.000	0.000	0.003	0.003	0.003	0.196	0.229	0.035	0.274	0.247	0.010	0.000
	49	SONOMA	0.001	0.001	0.051	0.051	0.051	0.139	0.139	0.051	0.178	0.128	0.210	0.001
SJV	10	FRESNO	0.001	0.001	0.002	0.002	0.001	0.056	0.059	0.008	0.307	0.428	0.136	0.001
	15	KERN	0.001	0.001	0.002	0.002	0.002	0.054	0.056	0.005	0.363	0.434	0.078	0.001
	16	KINGS	0.000	0.000	0.001	0.001	0.001	0.168	0.168	0.001	0.108	0.330	0.223	0.000
	20	MADERA	0.001	0.001	0.001	0.001	0.001	0.017	0.017	0.001	0.455	0.475	0.028	0.001
	24	MERCED	0.001	0.001	0.002	0.002	0.002	0.017	0.017	0.003	0.446	0.475	0.033	0.001
	39	SAN JOAQUIN	0.001	0.001	0.002	0.002	0.002	0.028	0.033	0.010	0.457	0.454	0.010	0.001
	50	STANISLAUS	0.000	0.000	0.001	0.001	0.001	0.005	0.006	0.001	0.489	0.491	0.004	0.000
	54	TULARE	0.001	0.001	0.001	0.001	0.001	0.063	0.063	0.001	0.374	0.431	0.063	0.001
SS	13	IMPERIAL	0.010	0.010	0.030	0.030	0.029	0.329	0.329	0.040	0.043	0.076	0.067	0.010
	33	RIVERSIDE	0.012	0.012	0.023	0.023	0.022	0.135	0.135	0.025	0.031	0.282	0.288	0.012
SV	4	BUTTE	0.000	0.000	0.000	0.000	0.000	0.003	0.004	0.001	0.483	0.484	0.025	0.000
	6	COLUSA	0.000	0.000	0.001	0.001	0.001	0.037	0.052	0.016	0.408	0.411	0.073	0.000
	11	GLENN	0.000	0.000	0.001	0.001	0.001	0.030	0.032	0.002	0.446	0.450	0.036	0.000
	31	PLACER	0.000	0.000	0.014	0.014	0.014	0.014	0.014	0.014	0.409	0.395	0.112	0.000
	34	SACRAMENTO	0.002	0.002	0.009	0.009	0.009	0.222	0.284	0.071	0.206	0.137	0.044	0.002
	45	SHASTA	0.000	0.000	0.059	0.059	0.059	0.083	0.083	0.059	0.316	0.258	0.025	0.000
	48	SOLANO	0.000	0.000	0.003	0.003	0.003	0.196	0.229	0.035	0.274	0.247	0.010	0.000
	51	SUTTER	0.000	0.000	0.001	0.001	0.001	0.025	0.050	0.026	0.427	0.407	0.059	0.000
	52	TEHAMA	0.000	0.000	0.002	0.002	0.002	0.005	0.006	0.002	0.489	0.489	0.002	0.000
	57	YOLO	0.000	0.000	0.002	0.002	0.002	0.111	0.155	0.046	0.348	0.308	0.026	0.000
	58	YUBA	0.000	0.000	0.002	0.002	0.002	0.005	0.005	0.002	0.471	0.469	0.042	0.000